Community-wide Consultation on Model Evaluation and Improvement

Please complete the following template by writing your answers into the boxes below the questions, sending any supplementary material such as clearly labeled figures in a separate file. Please submit your response electronically by ***15 September 2009*** to Anna Pirani at apirani@princeton.edu.

Q1: Please state your particular area of interest, e.g. global or regional climate or NWP modeling, seasonal prediction, sea-ice feedbacks, monsoons, troposphere-stratosphere exchanges, etc.

This is a coordinated response to the survey on behalf of the Cloud Feedback Model Intercomparison Project (CFMIP) (see www.cfmip.net). Our interest is in the impact on global and regional climate model predictions of uncertainties in the responses of cloud and precipitation processes, and mixing processes such as convection and boundary layer mixing which affect them.

Q2: Given your interest, what would you consider/identify as the KEY uncertainties/deficiencies/problems of current models? What do you think should be evaluated/improved as a priority in models in terms of parameterization and/or interactions among processes? (Give references and/or one key figure where possible)

The key problems are the representation of convective and boundary layer mixing, and the parametrization of macrophysical and microphysical cloud processes.

Q3: Do you see a particular gap (in knowledge, in observations or in practice) that would need to be filled, or a particular connection between different modeling communities or between modeling, process studies and observations that should be made a priority?

Links are being made between the climate modelling, cloud scale modelling and satellite and in-situ observation communities through CFMIP-GCSS collaboration and through the application of observation simulators to climate models in CMIP5/CFMIP-2. These links need to be developed and strengthened.

Q4: Do you see any particular resource or opportunity within the modeling/process study/observational/theoretical community (e.g. new results, new observations) that would be particularly useful and should be exploited to tackle this problem?

Opportunities include:

a) The availability of a wealth of new information on the vertical distribution and microphysical and dynamical properties of cloud and precipitation from active instruments at ground-sites and on the A-train constellation of satellites, and the recent development of a model-observation simulators to exploit this data for the quantitative evaluation of clouds in climate models. Also, the availability of long-term cloud property climatologies that increasingly cover more cloud variability timescales.

b) The application of techniques developed by the GCSS community to understand cloud feedback mechanisms. These include the use of high frequency model outputs at selected model locations, the use of idealised single column cloud feedback forcing cases to compare the responses of single column model

(SCM) versions of climate models with fine scale models, and the use of sensitivity experiments to explore the impact of different physical assumptions and to test hypotheses relating to cloud feedback mechanisms.

c) The availability of CFMIP-2 experiments as a part of the next set of IPCC coordinated experiments via CMIP5, to facilitate the evaluation and understanding of cloud feedbacks.

Q5 What would best accelerate progress on the topics raised in questions 1-4? Do you have suggestions for new initiatives (new process studies, field campaigns, or new collaborative approaches, eg international Working Groups, Climate Process Teams)?
The plans and strategy laid out by CFMIP-2 can provide a solid foundation for progress in this area (see www.cfmip.net). The problem is not so much a need for new initiatives, more the lack of resources / funding (particularly in climate modelling centres) to support participation in projects such as CFMIP-2.

Q6: Any other suggestions/issues to be raised?

The number of people actively working on development and improvements to cloud, boundary layer and convective parametrizations is small given the importance of these processes for climate prediction. No matter how much work is done evaluating and understanding models, those models will not improve unless substantial additional resources are put into basic physical parametrization development.

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On behalf of the CFMIP committee
January 2010